

ACCELERATED FADE APPARATUS AND METHOD OF ITS USE

FIELD OF THE INVENTION

This invention relates to apparatus for testing material for light fastness and deterioration under light. It particularly relates to a machine and method for testing of photographic materials.

BACKGROUND OF THE INVENTION

The testing of photographic materials for stability to light is carried out in order to predict the behaviors of such materials years in the future. Generally these tests are accelerated by applying relatively high levels of light to the materials for periods of between 3 weeks and 6 months, sometimes under elevated temperature conditions. The testing devices generally provide about 50K lux light. The typical device has a group of stationary light sources or a single 360° light source located inside a generally spherical arrangement. The samples are attached to the inside of the spherical framework, and the framework is rotated around the light source.

In another type of device, the light is in a box, and samples are arranged at various distances from the light source in order to obtain the exposure over a time period. In the box arrangement, the humidity and temperature also may be controlled to provide further accelerated aging effects or to simulate the use of the photograph in high exposure conditions.

Devices for testing light fastness also have been utilized in the paint and dye industry. Some such devices are merely arrangements of materials in areas such as Florida where there is a high percentage of sunlight available.

The previous devices suffered from several disadvantages. The long exposure periods required of 3 weeks to 6 months required research projects involving a need to know of stability improvements to proceed very slowly. Further, the light sources would vary in intensity over the term of the test as bulbs were replaced or aged so the test device puts out a different amount and quality of light. In addition, it was often difficult to control humidity and temperature conditions during the 6-month test, as the seasonal changes in the typical office or laboratory building occurred.

U.S. Pat. No. 5,138,892—Suga discloses a test device with the central light source with samples rotating around the source. U.S. Pat. No. 4,704,903—Suga et al discloses a light fastness testing machine with air flow control. U.S. Pat. No. 4,544,995—Suga discloses a light fastness testing machine with humidity control. U.S. Pat. No. 4,760,748—Katayanagi et al discloses a testing device with rotation of samples around a central light source.

PROBLEM TO BE SOLVED BY THE INVENTION

There is a need for a device to accurately, repeatably, and rapidly subject photographic materials to accelerated light fastness testing.

SUMMARY OF THE INVENTION

It is an object of the invention to overcome difficulties in color stability testing of prior apparatus and methods.

It is another object of the invention to provide a reliable light stability data in about two days.

It is another object of the invention to provide repeatable light stability data.

It is another object of the invention to provide a means to understand reciprocity law in failure of accelerated fade. The device has been shown to operate from 50K lux to 700K lux.

These and other objects of the invention generally are provided by providing apparatus for light fastness testing comprising a light source, means for dividing visible light from ultraviolet infrared radiation, means to direct the visible component of light into a spherical cavity, and means to mount test samples in apertures in said cavity.

In another embodiment the invention provides a method of light fading comprising providing apparatus for light fastness testing comprising a light source, a splitter for dividing visible light from infrared rays, means to direct the visible component of light into spherical cavity, and means to mount test samples in apertures in said cavity, placing test samples in said apertures, and subjecting said samples to light levels of greater than 500,000 Lux.

ADVANTAGEOUS EFFECT OF THE INVENTION

The invention provides the advantage that light stability testing of photographic materials may be carried out rapidly. The invention further provides a method and apparatus of light testing that is repeatable. The method and apparatus of the invention further provide the advantage that the testing has temperature stability, as well as completion of testing to allow prediction of many years of fade based on a test lasting less than three weeks.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a side view of a schematic of the apparatus of the invention.

FIG. 2 is a top view of the apparatus of the invention.

FIG. 3 is a side view on cross-sectional line 33 of FIG. 2 of the apparatus of the invention.

FIG. 4 is a cross-sectional view on line 4—4 of FIG. 1 of the apparatus of the invention.

FIG. 5 is a graph illustrating a comparison of high intensity fade data between the apparatus of the invention providing 600K lux of light with a prior art apparatus providing 50K lux. The results correlate very well.

DETAILED DESCRIPTION OF THE INVENTION

The invention has numerous advantages over prior apparatus and process. The invention allows the rapid testing of samples under very uniform and repeatable conditions. Further, the invention allows very high exposure to light in 10 to 20 days to surprisingly allow prediction of 20-year stability as accurately as the present 6-month low intensity test. The device further is compact and reliable. The device allows the samples themselves to have their temperature controlled independently from the amount of light to which they are exposed. The device further allows uniform exposure of all samples being tested at the same time. Present devices have a variance between exposure of samples in the middle of the collection as opposed to samples at the edges. The apparatus of the invention further allows repeatable results with different apparatus rather than having tests of stability only comparable between samples tested in the same apparatus. These and other advantages will be apparent from the discussion below.

FIG. 1 is a schematic illustration of the apparatus of the invention 10 from a side view. The device is enclosed by covers 12 over the light source 14 over the mirror and light